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THE KANSAS UNIVERSITY SCIENCE BULLETIN.

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Miocene Land Shells from Oregon.*

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(Plate I.)

THE exposures of fossiliferous rocks in the valley of the John Day river in Oregon have been known as a collecting ground for mammalian remains since 1861. Many expeditions have worked there and an extensive literature exists in which numerous types have been described. Fossil mollusks were obtained by the earliest collectors and subsequently and several papers have been written about them since 1870.

In 1907 an expedition was led into the region by Mr. H. T. Martin, curator of paleontology of the University of Kansas. Numerous specimens of vertebrate animals were secured and Mr. Martin also collected the land shells which form the basis of this report. Sixteen specimens belonging to eight species were found at Cove Inlet of John Day river. Four species appear to be new and are named and described herein.

Altogether thirteen species of mollusks have been collected in the John Day deposits, eleven being land pulmonates, one a fresh-water pulmonate and a fresh-water mussel. All are species not now known to exist but no genus has been considered to be new. The preponderance of the land forms has an interesting bearing upon the question of the lacustrine, fluviatile or æolian method of deposition of the strata.†

* Received for publication on February 2, 1920.

† For a full account of the geological, stratigraphical, and paleontological features of the region see, Merriam, "A Contribution to the Geology of the John Day Basin," University of California publications, Bulletin of the Department of Geology, vol. 2, No. 9, pp. 269-314, April, 1901. Also, same author and series, vol. 5, No. 1, pp. 1-64; December, 1906. Also, vol. 5, No. 11; Merriam and Sinclair for fairly complete bibliography, etc.; October, 1907.

The age of the beds is believed to be Miocene, a conclusion reached from a study of the fossil mammals and plants, and other geological features. A sufficient number of land and fresh-water shells has not been collected to have an important bearing on the subject. However, the long geological life of the molluscan genera found in these strata as compared with the disappearance of families and perhaps orders of mammals is a valuable commentary on the correlation of deposits elsewhere by the two classes of fossils when they are found singly. Not only have the mollusks passed through epochs of intense climatic change but they have withstood one of the most violent outflows of lava visible on the surface of the earth. Yet the genera found in the John Day and Mascall beds are represented in and near the same region to-day with closely allied species.

Ammonitella lunata Conrad.

Planorbis (*Spirorbis?*) *lunatus* Conrad, Am. Journ. Conch., vol. VI; p. 315, pl. XII, fig. 8, 1870. Condon collection. Bridge Cr., Ore.

Planorbis (*Spirorbis?*) *lunatus* White, 3d. Ann. Rep. U. S. Geol. Surv., p. 448, pl. XXXII, figs. 24, 25, 1880-'81. Published, 1883.

Gonostoma yatesi Cooper. Stearns (in White), Bul. 18, U. S. Geol. Surv., p. 16, pl. III, figs. 8-12, 1885. Cope and Condon Coll.

Ammonitella yatesi præcursor Stearns, Proc. Wash. Acad. Sci., vol. II, p. 656, pl. XXXV, figs. 8-12, 1900. Same figures reproduced as in Bul. 18, U. S. Geol. Surv., cited above.

Ammonitella yatesi præcursor Stearns, Science, New Series, vol. XV, p. 153, 190[illegible]. University of California Collection.

Ammonitella yatesi præcursor Stearns, Univ. of Calif. Pub. Geol., vol. V, No. 3, p. 6[illegible], 1906.

Although Conrad's description is very meager, taking it together with his figures leaves no doubt that he first described the shell which seems to have been collected by many exploring parties into the John Day region. His specimens were collected by Thomas Condon, the pioneer in the field and it is stated that they came from "Bridge Creek, Oregon." The error in considering it to be a species of the fresh-water genus *Planorbis* is not strange since Cooper says of *Ammonitella yatesi* (*Am. Jour. Conch., IV, 210, 1868*): "It would have been supposed to be a *Planorbis* if found near water, and if the streams of that country (Calaveras county, California) had not been thoroughly searched by many collectors."

Stearns first identified the fossils as *A. yatesi* Cooper but later reconsidered the matter and made them a new subspecies based chiefly on size. He says: "Though the fossil specimens are considerably larger than any of the recent ones, I am un-

able to detect any other difference." (*Proc. Wash. Acad. Sci., vol. II, p. 657, 1900.*)

The University of Kansas expedition secured two specimens of this interesting form and although they are not perfect I am able to point out specific differences which are of sufficient importance to continue the separation of the fossil from the living form. Comparison has been made with several fossil specimens in the collection of the University of California; also with 16 excellent specimens of *Ammonitella yatesi* Cooper from the Hemphill collection which now forms a part of the museum of the California Academy of Sciences. The recent shells came from "near Murphys, California," and were collected by Henry Hemphill.

One important difference is in size. The largest *yatesi* is but 9 mm. in greatest diameter, whereas the largest *lunata* (and it is imperfect) is 15 mm. The former also has eight whorls while the latter has nine. The umbilicus of *lunata* is proportionately wider and the apex is a hollow cone. The apex of *yatesi* is truncated inside and therefore shallower. On the ventral side of *yatesi* the last whorl swings out over the one preceding, but this is not true in the best specimen of *lunata*, although figure 1 of Stearns (White) indicates that there may be some variation in this respect in the fossil species.

MEASUREMENTS.

(All measurements are in millimeters.)

	A. yatesi.	*A. lunata.*	
Greatest diameter	9.00	15.00	12.50
Least diameter	8.00	13.50	11.00
Greatest altitude	4.50	7.50	6.50

No measurements of the fossils studied by Conrad, Stearns and White have been published. Their figures show that the shell substance of the body whorl has been lost, a condition which is almost always the case. The University of Kansas specimens are in that condition, but through the kindness of Prof. Bruce L. Clark, I was permitted to examine well-preserved material in the University of California. It was learned that the shells are smooth and shining as in the recent species, with growth wrinkles barely showing on the latter part of the body whorl.

Gastrodonta imperforata Hanna. New species.

(Plate I; figures 1, 2, 3.)

Whorls six; spire high and dome-shaped; sutures moderately impressed; apex marked with fine regular growth lines; growth lines on the body whorl slightly uneven but without an approach to a ribbed con-

dition; last whorl slightly descending at the aperture; peristome thin and acute, slightly expanded on the basal portion; umbilical region deeply impressed, the perforation being minute. Greatest diameter, 17.50. Least diameter, 16. Altitude, 13.

Type in the University of Kansas from Cove Inlet, John Day river, Oregon, collected by H. T. Martin in 1907.

A single specimen was obtained. The dome-shaped shell and thin, acute peristome prevents its being classed as *Polygyra dalli*, the species with which it is most apt to be confused. Its correct generic position cannot be stated because of minor shell differences which separate many of the groups of recent pulmonates. It resembles in general shape some of the *Gastrodontas* as *intertexta*, for instance. The fact that the lip is slightly expanded below is the chief character which casts some doubt upon its being a *Gastrodonta*. This condition is met with in *Oreohelix* and our shell resembles in form and size some of the dome-shaped varieties of *O. cooperi*, as, for instance, *apiarium* Berry. It might be placed directly in this genus were it not for the differentiating characters of the umbilicus.

The specimen is slightly defective as shown by the photographs but it is sufficiently intact it seems to make the species easily recognizable in the future.

There is a second specimen in the collection of the University of California which is similar in all respects to the type, except perhaps it is a little better preserved.

Pyramidula mascallensis Hanna. New species.

(Plate I; figures 4, 5, 6.)

Whorls six and three-fourths, rounded below and flat above; spire not greatly elevated; suture apparently channeled; last whorl carinated through the first two-thirds, the carina gradually disappearing; latter part of last whorl depressed below the carina of the one preceding; the shell substance of the apical whorls is preserved but sculpture is absent; the body whorl is an internal cast but shows on the upper side some coarse uneven growth ridges; umbilicus widely open. Greatest diameter, 33.50. Least diameter, 30.25. Altitude, 28.

Type in the University of Kansas from Cove Inlet, John Day river, Oregon, collected by H. T. Martin in 1907.

Only the type specimen was secured so that a statement of variation cannot be given. The flattened upper whorls and the apparently deeply channeled suture distinguish this shell from other species. It may represent a new generic type, but the genera of land shells were so often based upon anatomical

and minor shell characters that it seems best for the present to include this under *Pyramidula,* the genus which it most resembles. Perhaps better material will eventually be secured and enable the correct genus to be determined. The specimen is not perfect. The aperture has been lost, together with the shell substance of the last two whorls. It has also been crushed but not in such a manner as to distort the shape. The original shell had over seven whorls and was considerably more elevated than the measurements given show. But the diameter was but little if any greater on account of the last whorl growing in beneath the one preceding. Also when the shell was complete the last whorl was but little angulated on the periphery, this seeming to be a character which applies only to the whorls up to and including the sixth.

It is named for the Mascall, one of the subdivisions of the John Day series.

At first it was believed that this specimen was Conrad's *Helix* (*Zonites*) *marginicola* because it was the only form found with the "spire scarcely raised above the margin of the last volution." However, he states that his shell had six whorls and was narrowly umbilicate. He gave no measurements, but his figure shows that he had a young specimen. He states further that his shell was narrowly umbilicate, a condition which would not be true in the young of *mascallensis.* There is, in my opinion, little doubt that one of the species subsequently described under another name is *marginicola,* but this cannot be recognized because of the inadequate original description. It is to be hoped that if the type specimen is in existence it will some day be fully described.

Polygyra dalli Stearns.

Helix (*Monodon*) [*error for Mesodon*] *dalli* Stearns. In White, Bul. 18, U. S. Geol. Surv., p. 14, pl. III, figs. 4-6, 1885.

Polygyra dalli Stearns, Proc. Wash. Ac. Sci., vol. II, p. 655, pl. XXXV, figs. 4-6, 1900. Same figures as above reproduced.

Polygyra dalli Stearns, Science, new series, vol. XV, p. 153, 1902.

Polygyra dalli Stearns, Univ. of Calif. Pub. Geol., vol. V, No. 3, p. 67, 1906.

One almost perfect specimen and four young and broken ones were obtained at Cove Inlet, John Day river, by Mr. Martin. A large number of specimens in the University of California indicates that this is probably the most abundant species in the region. As Stearns has shown, it is very closely related to *Polygyra columbiana* Gould, which is common in the

Pacific coast states to-day. The latter, however, is smaller; some specimens of *dalli* are almost as large as *thyroides* of Kansas and Missouri. The umbilicus of the fossil species is covered by the narrowly reflected peristome and its junction with the body whorl is deeply seated. There appears to be no tendency for the peristome to descend more or less abruptly near its outer termination with the body whorl.

Polygyra expansa Hanna. New species.

(Plate I; figures 7, 8, 9.)

Whorls about seven, somewhat flattened above and below; sutures not deeply impressed; lines of growth apparently uneven on the last whorl and broken into ridges parallel thereto; the last whorl of the type is subcarinate at its beginning due to pressure, but is flattened naturally on the lower side; axis imperforate and covered with heavy shell substance; the junction of the peristome with the body whorl in the umbilical region is marked with a distinct angular depression; it is not a gently concave depression as found in such recent *Polygyras* as *albolabris*. Greatest diameter, 32. Least diameter, 28.50. Altitude, 17.

Type in the University of Kansas from Cove Inlet, John Day river, Oregon, collected by Mr. H. T. Martin.

A single specimen was secured and it is not in as good condition as would be desired. Its characters are so distinct, however, that it cannot be referred to any known form. The imperforate axis covered with heavy callus places it in *Polygyra* rather than in *Epiphragmophora*. However, it is flattened on the base and has a tendency to be slightly carinated as some forms of *fidelis* Gray of the latter genus.

A single, and better preserved specimen in the University of California shows, in addition to the above characters, that the outer lip abruptly descends at its junction with the body whorl for a distance of 4 mm.

Polygyra martini Hanna. New species.

(Plate I; figures 10, 11, 12.)

Whorls five, well rounded, the last being conspicuously enlarged vertically; sutures moderately impressed; lines of growth very fine for a shell of this size and very regular, crossed by less impressed revolving striæ which are most noticeable on the body whorl; umbilical region deeply impressed; lip thickened by callus and reflected over almost the entire umbilicus; no indication of a noticeable deflection of the peristome at its junction with the body whorl. Greatest diameter, 34.50. Least diameter, 25. Height of body whorl, 19. Altitude without body whorl, 18. Altitude (total), 28.

Type in the University of Kansas from Cove Inlet, John Day river, Oregon, collected by Mr. H. T. Martin in 1907.

A single well-preserved specimen was secured. While it resembles in general shape some of the old world species, as *Pomatia aspera* for instance, it is believed to be more closely related to the *albolabris* group of *Polygyra*. It must be stated, however, that important differences exist. The shell is more globose than other species of this genus and the umbilical region is more deeply impressed. While most of the margin is broken away, enough remains to show that it was folded back upon itself in the basal region and the body whorl was obtusely keeled in this region.

The shell resembles in some respects the *Helix leidyi* of Hall and Meek (*White, 3d. Ann. Rep. U. S. Geol. Surv., p. 455, pl. XXXII, figs. 32, 33, 1881-'82*), but it is proportionately more elevated and the body whorl is deeper in a vertical direction. The two species belong to the same section of the genus which may be defined by the form of the lower apertural margin and the angular body whorl in the umbilical region.

The species is named in honor of Mr. Martin, an indefatigable collector of fossils.

Epiphragmophora dubiosa Stearns.

Epiphragmophora dubiosa Stearns, Science, new series, vol. XV, p. 153, 1902. (Original description.)

Epiphragmophora dubiosa Stearns, Univ. of Calif. Pub. Geol., vol. V, p. 69, figs. 3, 4, 1906. Original description repeated and figures provided.

Only one specimen of this interesting species was found. The shell is imperfect, as was the type, but enough remains to show that it is narrowly umbilicated; very flat below and spire but little elevated; whorls flattened above and sutures but little impressed; the pitting on the apex mentioned by Stearns cannot be seen, but this may be due to the worn condition of the shell substance; for the same reason the growth striæ are not well preserved. Greatest diameter, 23. Altitude, 12. Whorls, five and three-fourths.

It is not certain that the form is placed in the correct genus, but without better preserved material for study it would be useless to attempt any other disposition. Doctor Stearns states and shows in his figure that the sutures are deeply impressed. It is believed, however, that this is not natural, as the Kansas University specimen and four others seen in the University of California did not show them noticeably deepened. Snails of this group are known to be subject to con-

siderable variation in this respect so that it would not seem to be justifiable to consider them distinct on this character when otherwise all which have been seen agree with the description and figures. Unfortunately the formation of the aperture in the species cannot be determined.

Epiphragmophora antecedens Stearns.

Helix (*Aglaia*) *fidelis* Gray. Stearns (in White) Bul. 18, U. S. G. S., p. 14, pl. III, figs. 1-3, 1885.

Epiphragmophora fidelis antecedens Stearns, Proc. Wash. Acad. Sci., vol. II, p. 653, pl. XXXV, figs. 1-3, 1900.

Epiphragmophora fidelis antecedens Stearns, Science, new series, vol. XV, p. 153, 1902.

Epiphragmophora fidelis antecedens Stearns, Univ. of Calif. Pub. Geol., vol. V, p. 67, 1906.

Four specimens which clearly belong to this species were found. One is fully grown. It shows that the umbilicus was normally completely closed and thickened with callus, a condition which does not obtain in *E. fidelis*. The umbilicus, however, is of the general form found in *Epiphragmophora* and not that which is common in *Polygyra*. The best specimen Stearns had was imperforate, but it seemed to have been caused by crushing. This is now known to be normal.

In order to complete the record the other species of mollusks known from the John Day Miocene will be mentioned. The original generic terms ascribed to them are retained. No object would seem to be gained by attempting a rearrangement at this time. The full synonomy of *Unio condoni* White has not been searched for.

1. *Unio condoni* White, Bul. 18, U. S. Geol. Surv., p. 13, pl. II, figs. 1-3, 1885.
2. *Limnæa maxima* Stearns, Science, new series, vol. XV, p. 154, 1902.
   Limnæa maxima Stearns, Univ. of Calif. Pub. Geol., vol. V, p. 70, fig. 1, 1906.
   Limnæa stearnsi Hannibal (in Baker) *Limnæidæ* of N. and Mid. Am., p. 102, pl XVII, fig. 11, 1911. New name for *L. maxima* above, preoccupied by Collin Ann. Soc. Mal. Belg., VII, p. 94, 1872.
3. *Helix* (*Zonites*) *marginicola* Conrad, Am. Jour. Conch., vol. VI, p. 315, pl. XIII fig. 9, 1870. Bridge creek, Oregon. Condon, Coll.
   Helix (*Zonites*) *marginicola* White, 3d Ann. Rep. U. S. Geol. Surv., p. 453, pl 32, fig. 34, 1880-'81.
4. *Helix* (*Patula*) *perspectiva* Say. Stearns, Bul. 18, U. S. Geol. Surv., p. 14, pl III, fig. 7, 1885.
   Pyramidula perspectiva simillima Stearns, Proc. Wash. Acad. Sci., vol. II, p. 657 pl. XXXV, fig. 7, 1900.
   Pyramidula perspectiva simillima Stearns, Science, new series, vol. XV, p. 153 1902.
   Pyramidula perspectiva simillima Stearns, Univ. of Calif. Pub. Geol., vol. V, p. 67, 1906.
5. *Pyramidula lecontei* Stearns, Science, new series, vol. XV, p. 154, 1902.
   Pyramidula lecontei Stearns, Univ. of Calif. Pub. Geol., vol. V, p. 68, fig. 2, 1906.

The reader is referred to a paper by Harold Hannibal (*A Synopsis of the Recent and Tertiary Mollusca of the Cali-*

fornian Province; Proc. Mal. Soc. London, vol. X, pp. 112-211, 1912) which may perhaps have references to the John Day fauna. The paper has not been favorably reviewed. (*Pilsbry, Nautilus, XXVI, 71, 1912.*) I have not seen it and cannot comment on what it contains, but apparently Hannibal, in working over the John Day material in the University of California, combined at least four species under the name *Helix marginicola* Conrad. Some of them bore Stearns' labels and probably some of them were his types.

EXPLANATION OF PLATE I.

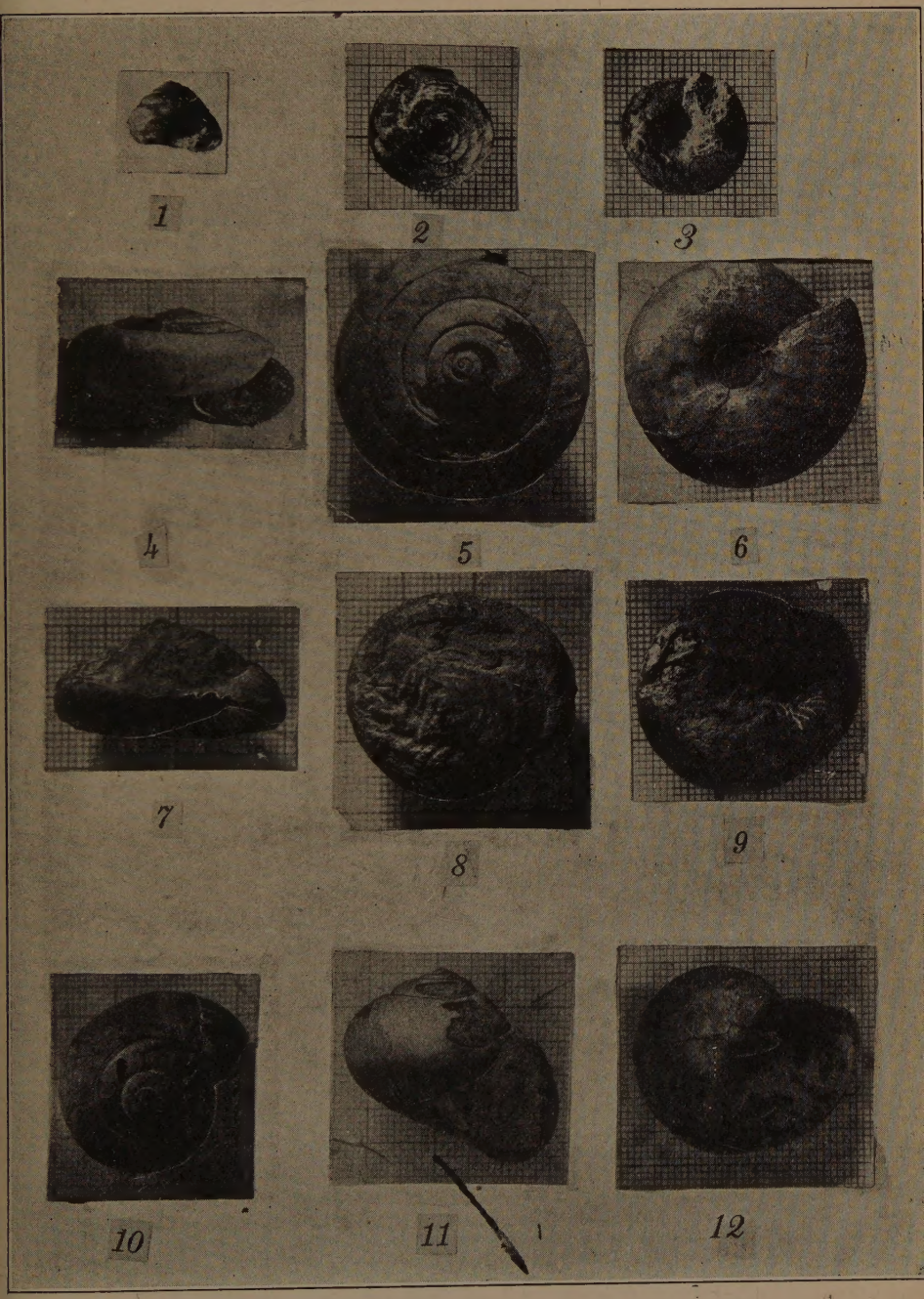
The figures are from photographs which have been retouched. The photographs were taken with millimeter cross-section paper for a background and the scale can be obtained from this. Figure 1 is less enlarged than figures 2 and 3.

Figures 1, 2 and 3. *Gastrodonta imperforata* new species.

Figures 4, 5 and 6. *Pyramidula mascallensis* new species.

Figures 7, 8 and 9. *Polygyra expansa* new species.

Figures 10, 11 and 12. *Polygyra martini* new species.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